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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/008,059	11/13/2001	Achim K. Heibel	SP00-383A	3896

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CORNING INCORPORATED
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EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 01/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary	Application No.	Applicant(s)	
	10/008,059	HEIBEL ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on October 24, 2003 has been received and carefully considered. The changes made to the Specification and Drawings are acceptable. Claim 20 has been added. Claims 1-9 are cancelled. Claims 10-20 remain active.

Response to Arguments

2. Applicant's arguments with respect to the rejection of claims 10-19 under 35 U.S.C. 102(b) or 35 U.S.C. 103(a) as being anticipated or unpatentable over Hoelderich et al. has been fully considered and are persuasive. Furthermore, applicant's arguments with respect to the rejection of claims 10-12 and 18 under 35 U.S.C. 102(b) as being anticipated by Dettling et al. has been fully considered and is persuasive. Therefore, said rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art reference(s). See below.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 10-12, 14 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schanke et al. (GB 2 322 633) in view of Dettling et al. (US 4,335,023).

Schanke et al. discloses a method for carrying out a liquid/solid reaction or gas/liquid/solid reaction or gas/liquid mass transfer process (i.e., a catalytic hydrogenation process; page 2, line 24 to page 3, line 21) comprising the step of conveying a liquid or

gas/liquid feed stream (i.e., introduced via liquid distributor **12** and gas inlet **14**; FIG. 1; page 13, lines 8-17) through a solid catalyst of honeycomb configuration comprising a plurality of parallel channels bounded by catalytically active walls traversing the catalyst from an inlet end to an outlet end thereof (i.e., monolithic catalyst **12**; FIG. 1, 3, 4a, 4b; page 14, lines 2-16).

As illustrated in FIG. 4b, the cross-sectional shape of channels **22** is square, and a thin layer of catalyst **23** is coated onto the walls of the channels. Schanke et al. is silent as to the channels **22** being free of angled corners and curvatures with curvature radii below 10% of the average channel diameter. However, Schanke et al. discloses,

> "[m]ass transfer (diffusion) effects are also *very important in determining selectivity*," and, "[t]he key parameter is the characteristic diffusion distance, determined by the catalyst pellet size or *the thickness of the catalytic layer*. As a guideline, negative effects on selectivity are experienced for diffusion lengths above 0.1 - 0.4 mm, corresponding to 0.2 - 0.8 mm diameter spherical pellets (the exact value depending on catalyst properties and reaction conditions)," (page 4, lines 2-17).

As suggested by this teaching, one of ordinary skill in the art at the time the invention was made would have selected a honeycomb catalyst having a catalyst layer of uniform, minimal thickness in the method of Schanke et al., in order to minimize any undesirable mass transfer (diffusion) effects and thereby maximize selectivity. The use of honeycomb catalyst supports configured without, "angled corners and curvatures with curvature radii below 10% of the average channel diameter," for producing a catalyst layer of uniform, minimal thickness, is conventionally known in the art, as evidenced by Dettling et al.

Dettling et al. (Abstract; FIG. 1, 1A-C; column 3, lines 1-31, 53-66; column 7, lines 8-52) teaches a honeycomb catalyst support member **10** comprising a plurality of longitudinal fluid flow channels **16**, wherein the channels **16** comprise "filleted" or "rounded" corners and a

catalytically promoting material **22** dispersed as a coating on the walls **18** of the channels **16**, the member **10** being effective for both oxidation and reduction reactions. Dettling et al. further teaches, "the more acute the angle which is formed by the juncture of adjacent walls, the more aggravated is the problem of the formation of *excessively thick or deep pockets of coating material in the corners* formed by the juncture," (column 8, lines 58-63). A honeycomb catalyst support member configured with "filleted" or "rounded" corners, however, "prevents the 'burying' of catalytic material too deeply to be effective in connection with treating gases (or liquids) flowed through the flow channels," (column 20, lines 16-49). A comparison of the honeycomb support with angled corners, as shown in FIG. 2, to the honeycomb support with rounded corners, as shown in FIG. 1B, illustrates the uniform, thin, catalytic coating that may be achieved with rounded corners (column 8, lines 29-44).

4. Claims 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schanke et al. (GB 2 322 633) in view of Dettling et al. (US 4,335,023), as applied to claim 10 above, and further in view of Suzumura et al. (JP 58-096685).

Although the particular gas/liquid/solid reaction as disclosed by Dettling et al. is directed towards Fischer-Tropsch synthesis, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a different reaction, such as a gas/liquid/catalyst hydrotreating reaction, for the reaction in the modified method of Schanke et al., because the results of improved mass transfer (diffusion), selectivity and/or conversion exhibited by the monolithic, honeycomb type structure, as collectively taught above, would inherently apply to other gas/liquid/solid reactions, as dictated by physics. Furthermore, the use of monolithic, honeycomb type structures for conducting gas/liquid/catalyst hydrotreating reactions is

conventionally known in the art, as evidenced by Suzumura et al. (Abstract; Figures), who teaches a method of carrying out a gas/liquid/catalyst hydrotreating reaction (i.e., hydrocracking of a liquid oil and hydrogen feedstream, introduced through line **3**) by conveying the gas/liquid feed stream through a solid catalyst of honeycomb configuration (i.e., catalyst layers **1**) comprising a plurality of parallel channels bounded by catalytically active walls traversing the catalyst from an inlet end to an outlet end thereof (i.e., see FIG. 2a-d).

5. Claims 15, 16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schanke et al. (GB 2 322 633) in view of Dettling et al. (US 4,335,023), as applied to claim 10 above, and further in view of Bengtsson (US 5,063,043).

Schanke et al. discloses,

> "In a monolithic reactor operating in two-phase flow (gas + liquid), particularly under Taylor Flow conditions, mass transfer occurs mainly in the thin film between the cylindrical bubbles and the channel walls containing the catalytic material. This mode of flow occurs over *a wide range of gas and liquid superficial velocities*. However, at very high gas velocities, the flow regime changes to "annular flow", characterized by less favourable mass transfer properties." (page 6, lines 3-11).
>
> "A primary goal in any FT-process is to achieve a high conversion per pass, in order to achieve high yields and reduce recycle and investment costs. For any reaction, the *reaction kinetics and the mixing characteristics of the reactor will determine the necessary reaction volume for reaching the desired conversion.*" (page 6, lines 26-34).
>
> "Classical chemical reaction engineering principles teach that chemical reactions characterized by a positive order dependence of reactant concentrations are *most efficiently carried out in plug-flow.*" (page 7, lines 13-21).

However, Schanke et al. is silent as to the reaction being conducted under the specifically recited conditions of a liquid linear velocity of between 0.01 and 100 cm/s or a feed gas/liquid volume ratio of between approximately 0 and 1000. In any event, it would have been obvious for one of

ordinary skill in the art at the time the invention was made to select an appropriate liquid linear velocity or feed gas/liquid volume ratio to achieve a desired conversion or two-phase flow regime in the modified method of Schanke et al., because the specific liquid linear velocity or feed gas/liquid volume ratio is not considered to confer patentability to the claim since the precise velocity or ratio, respectively, would have been considered a result effective variable by one having ordinary skill in the art. Also, it is noted in the present specification that the claimed velocities and ratios, are at best, preferred limitations. As such, without more, the claimed ratio cannot be considered "critical". Accordingly, one having ordinary skill in the art would have routinely optimized the liquid linear velocity and/or feed gas/liquid volume ratio in the system to obtain the desired conversion or flow characteristics, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Bengtsson evidences the conventionality of this concept. In particular, Bengtsson (Abstract; column 3, lines 22-56; FIG. 3) teaches a method of carrying out a gas/liquid/solid reaction (i.e., catalytic hydrogenation) comprising the step of conveying a liquid or gas/liquid feed stream through a monolithic catalyst in the form of parallel channels, wherein various process parameters, including feed stream gas proportion % (i.e., proportional to the gas/liquid volume ratio) and downstream liquid flow velocity m^3/m^2s (i.e., equivalent to the liquid linear velocity), are varied in order to produce a desired flow within the channels (i.e., pure liquid flow, plug flow, annular flow, etc.; EXAMPLE 1; TABLE 1). Using the example's channel diameter and height, a gas proportion of 0% (i.e., gas/liquid volume ratio = 0) and a liquid linear velocity

of 0.43 m^3/m^2s produces a single phase, pure liquid flow. A gas proportion of 43% (i.e., inherently a gas/liquid volume ratio between 0 and 1000) and a liquid linear velocity of 0.24 m^3/m^2s produces a plug flow. Bengtsson teaches plug flow is preferred.

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schanke et al. (GB 2 322 633) in view of Dettling et al. (US 4,335,023), as applied to claim 18, and further in view of Behl et al. (DE 3 735 758).

Although the particular gas-liquid mass-transfer process disclosed by Dettling et al. is directed towards Fischer-Tropsch processes, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a different gas-liquid mass-transfer process (such as absorption, scrubbing, stripping or distillation) for the modified method of Schanke et al., because the results of improved mass transfer (diffusion), selectivity and/or conversion exhibited by the monolithic, honeycomb structure as collectively taught above would inherently apply to other gas-liquid mass-transfer processes, as dictated by physics. Furthermore, the use of a monolithic, honeycomb structure for conducting such processes is conventionally known in the art, as evidenced by Behl et al. (Abstract; Figures). Behl et al. teaches a method of carrying out the gas-liquid mass-transfer process of stripping, comprising the step of conveying a gas/liquid feed stream (introduced via **3**, **4**) through a monolithic catalyst bed **2**, whereby oxygen gas dissolved in the liquid feed stream is "stripped" from the liquid feed in the presence of hydrogen, via catalytic hydrogenation.

7. Claims 10-14, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzumura et al. (JP 58-096685) in view of Dettling et al. (US 4,335,023).

Suzumura et al. (Figures; Abstract) disclose a method for carrying out a liquid/solid

reaction or gas/liquid/solid reaction or gas/liquid mass transfer process (i.e., a gas/liquid/catalyst hydrogenation or hydrotreating process) comprising the step of conveying a liquid or gas/liquid feed stream (i.e., liquid oil and hydrogen gas, introduced via line **3**) through a solid catalyst of honeycomb configuration (i.e., catalyst layers **1**) comprising a plurality of parallel channels bounded by catalytically active walls traversing the catalyst from inlet to outlet thereof (see FIG. 2a-2d). However, Suzumura et al. is silent as to the cross-sectional shape of the channels being, "free of angled corners and free of curvatures having curvature radii below 10% of the average channel diameter." The same comments with respect to Dettling et al. apply (see above). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the method of Suzumura et al., such that the gas/liquid feed stream was conveyed through a solid catalyst of honeycomb configuration without angled corners or curvature radii below 10% of the average channel diameter, because a honeycomb catalyst support member configured with filleted or rounded corners, as taught by Dettling et al., "prevents the 'burying' of catalytic material too deeply to be effective in connection with treating gases (or liquids) flowed through the flow channels," (column 20, lines 16-49).

8. Claims 15, 16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzumura et al. (JP 58-096685) in view of Dettling et al. (US 4,335,023), as applied to claim 10 above, and further in view of Bengtsson (US 5,063,043).

Suzumura et al. is silent as to the reaction being conducted under the specifically recited conditions of a liquid linear velocity of between 0.01 and 100 cm/s or a feed gas/liquid volume ratio of between approximately 0 and 1000. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate liquid linear

velocity or feed gas/liquid volume ratio to achieve a desired conversion or two-phase flow regime in the modified method of Suzumura et al., because the specific liquid linear velocity or feed gas/liquid volume ratio is not considered to confer patentability to the claim since the precise velocity or ratio, respectively, would have been considered a result effective variable by one having ordinary skill in the art. Also, it is noted in the present specification that the claimed velocities and ratios, are at best, preferred limitations. As such, without more, the claimed ratio cannot be considered "critical". Accordingly, one having ordinary skill in the art would have routinely optimized the liquid linear velocity and/or feed gas/liquid volume ratio in the system to obtain the desired conversion or flow characteristics, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Also, The same comments with respect to Bengtsson apply (see above).

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzumura et al. (JP 58-096685) in view of Dettling et al. (US 4,335,023), as applied to claim 18, and further in view of Behl et al. (DE 3 735 758).

Although the particular gas-liquid mass-transfer process as disclosed by Suzumura et al. is directed towards hydrogenation or hydrotreating processes, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a different gas-liquid mass-transfer process (such as absorption, scrubbing, stripping or distillation) for the modified method of Suzumura et al., because the results of improved mass transfer (diffusion), selectivity and/or conversion exhibited by the monolithic, honeycomb structure as collectively taught above

would inherently apply to other gas-liquid mass-transfer processes, as dictated by physics. Also, the same comments with respect to Behl et al. apply (see above).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung
January 8, 2004

Hien Tran

HIEN TRAN
PRIMARY EXAMINER